



Ø BEAT



COLORADO SPRINGS,
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OCTOBER 1986

PIKES PEAK RADIO AMATEUR ASSOCIATION, INC.
P.O. Box 16521
COLORADO SPRINGS, CO 80935

FIRST CLASS MAIL



Ø BEAT



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ZERO BEAT is published monthly in the interest of the members of the Pikes Peak Radio Amateur Association, Inc., P.O. Box 16521, Colorado Springs, Colorado 80935. Cost is 50¢ per month for non-members or a \$4.00 per year subscription. Permission is given to reprint articles or excerpts provided credit is given. Deadline for submission of articles is the 21st of the month. Classifieds accepted anytime.

The Pikes Peak Radio Amateur Association meets on the second Wednesday of each month at Giuseppe's Depot Restaurant at 10 S. Sierra Madre at 7:30 p.m. All amateurs and interested parties are invited to attend.

Editor: Phil Somers VE1ARC, 1075 Allegheny Dr. Colorado Springs, CO 80919 590-7136

GREETINGS FROM DON, KEØBJ

Vice-President, PPRAA

Almost a year has passed since I took office to serve as your vice-president. I have enjoyed the challenge and have had lots of fun running the raffle each month, which seemed to be my primary duty.

We have experienced a few changes, I think, which for the most part have, if nothing else, generated a considerable amount of discussion (Hi Hi).

It makes me feel good to see people laugh and enjoy themselves and, at the same time, provide a service to mankind, not only in our community but throughout the world, with such projects as Novice classes and community fund raising walks, hillclimbs, cross-country enduros, and emergency weather conditions, both locally and abroad.

I thank you all for the opportunity to be involved with some of the finest people in the world, those who have dedication, willingness, and desire to be of service and ask for nothing in return -- the fraternity of ham radio operators.

73. TNX. Don, KEØBJ.



Frank Royball is the first graduate of Jim's (WA9ABB) Novice classes at the Colorado School for the Deaf and Blind. Congratulations to both Frank and Jim.

OCTOBER MEETING

The next regularly scheduled meeting of the Pikes Peak Radio Amateur Association will be held on Wednesday, October 8 at 7:30 PM at Giuseppe's Depot at #10 S. Sierra St. The tentative program is so tentative that you will have to attend the meeting to find out what it is.

"VIEW FROM THE PEAK"

by George Hinds, N8CIX/Ø

IT SURE WOULD HELP IF:

Folks putting out a call on repeaters (and on simplex, too) would announce the frequency or repeater they're on? In this day of scanning receivers, a call may go unanswered because you can't catch which repeater or simplex frequency the calling station was using.

On more than one occasion, at home and while mobile, I've heard a call, or part of a call, where someone possibly was looking for help or at least a conversation. Too late! The rig has begun scanning again and who knows where the caller was?

So, unless you're one of those rare birds who uses but one repeater, or a single simplex frequency, try to make a habit of stating where you are listening: completed contacts might just increase. In an emergency, it's doubly important!

WATCH FOR SIGNS POSSIBLY:

Showing up in the rear windows of your friendly neighborhood amateur radio operators' automobile, patterned after the now-familiar diamond shape yellow signs that remind you of "Baby On Board" or "Wife in Trunk."

These will read: "Take A Ham To Dinner" or "Don't Touch This Car - You May Suffer (RF) Burns" or "Hams Are Better Lovers" or ?????? Yesterday: bumper stickers; tomorrow: window signs - what will follow? (Perhaps a ticket and fine for obstructing vision?)

PICNICS ARE GREAT FUN:

And the PPRAA picnic on Sunday, Aug. 10th was no exception - but where were you? You were missed. About 25 of us gathered at Oak Stocktons' (KØROL) place south of Lake George for what turned out to be a most pleasant time - good food, cold drinks and good friends. While there were games such as horseshoes and volleyball available, it seemed everyone was content to take in the fresh mountain air, to eat, and to just relax and chat (and check out packet radio operation and

the multitude of hummingbirds feeding on the porch feeders). Thanks!, Oak, it was a fine day...

And on August 24th, the group from Pikes Peak FM Association held their annual picnic - it was at the home of Bud WBØTIB in Black Forest. Here about 80 guys, gals, and offspring gathered to feast on a wide variety of salads, hot dogs and hamburgers, and other goodies. The weather was perfect and test gear was available to check frequency, deviation and sensitivity. As might be expected, too many of us ate too much - but it was so-o-o good!

"GIGO: GARBAGE IN, GARBAGE OUT

And that's what you find in repeater directories so often - in the sense that from 25 to 50% of the repeaters listed are not on the air, never have been on the air, and never will be on the air.

Just a look at the newest ARRL directory will indicate what is wrong: under "DENVER" on UHF repeaters you'll find over 40 listed - now check them out to see which are on the air. You'll find out that about two-thirds are - the rest are just listings, not real live repeaters. But someone, months or even years ago, said he would have a repeater operating and so the frequency is "reserved" and thus unavailable to be reassigned.

More frequencies reserved for what??? And the same is true for Colorado Springs and for most areas of the nation. Some amateur, years ago, had dreams of putting on a repeater - the dreams stayed just that: dreams - and though there is no repeater in sight, the frequency is lost to others. Multiply that by the hundreds - now you see why the Repeater Directory lists so many systems.

What can be done to free up this space? On July 12th the new repeater docket became the rule - and FCC held that decoordination of repeaters was just as essential as coordination. If these "non-repeaters" were deleted from directories, we'd have a more accurate guide to go by, a more compact directory, and coordinators would have frequencies at hand so as to re-coordinate active repeaters that now suffer interference such as is brought about by the 15kHz bandplan in

use in most states. With "non-repeaters" permanently squelched, there would be more frequency choices for active repeaters.

If this project started tomorrow, it would be overdue...for long unused frequency assignments are vexing problems for every council and coordinator.

AIRLINES NIX USE OF LAPTOP COMPUTERS

Some airlines, claiming in-flight use of computers by passengers might interfere with flight navigation equipment, have banned such use. This is despite assurances from the FAA that such computers are safe for such use. Some such airlines are People Express, KLM, Pacific Southwest Airlines and Lufthansa. So, if you are taking a trip soon and had ideas of taking your laptop with you, better check with the airline first. You can bet some airlines are jumpy since the Korean incident of 1983 when a Korean Air Lines aircraft was shot down for straying from course and ended up going over USSR territory.

ANOTHER BIRD-BRAINED IDEA FESTERING?

The proposal for non-amateur use of six-meters truly is an example of witless action -- to create a public digital network between 52 and 54 MHz! Apparently the basis for the proposal is the seeming lack of use by amateurs -- but did the proponents of the new scheme stop to consider why this band is "under-utilized" in its use in so many areas? Hardly...

Transmitters in this band would emit harmonics in the middle of the FM broadcast band at 102 to 104 MHz; further, since TV Channel 2 operates adjacent to this ham band, it is a sad, but proven, fact that interference problems would arise to TV stations from widespread use. Imagine the havoc potential from hordes of digital transmissions -- what a problem for the already undermanned FCC. Let's hope this proposal gets the disposition from the Commission it richly deserves.

73, George, N8CIXØ

HAM LICENSING

VE Program, Colorado Springs

VE testing for the purpose of obtaining or upgrading an Amateur Radio Station /operator license, sponsored by the Pikes Peak Radio Amateur Association, will be conducted on Nov 15, 1986 at the First United Methodist Church located at 420 N. Nevada Ave., Colorado Springs, starting at 9:00 A.M. PRE-REGISTERED applicants and WALK-INS are welcomed.

Instructions:

- A. PRE-REGISTERED Applicants must mail:
1. Completed current FCC form 610.
 2. Photocopy of current license.
 3. A check or money order for \$4.25 payable to ARRL/VEC.
 4. The above must reach the volunteer examiner team contact by 10 Nov 1986.

Send application to our team contact:

Peter LaFosse - NØLA
5750 N. Meridian Rd.
Peyton, CO 80831

- B. WALK-INS must bring to test site:
1. If currently licensed, your current license.
 2. A photocopy of your current license.
 3. A check or money order for \$4.25 payable to ARRL/VEC.

NOTE: All applicants will be required to provide photo proof of identification at time of examination.

Handicapped applicants should notify the team contact immediately so that appropriate procedures can be coordinated.

For further information, please contact either Ron Deutsch NK6P 593-8352 or Peter LaFosse NØLA 495-4829.

Membership in PPRAA or the ARRL is not a requirement for taking the above test.

Talk-in will be on the 146.37/97 repeater.

VHF AND ABOVE
BY RON DEUTSCH NKØP

THE PERSEIDS METEOR SHOWER PEAKED ON AUGUST 12TH AND PROVIDED AMATEURS WITH AN OPPORTUNITY TO WORK OUT TO 1000 MILES ON 144 MHZ AND 220 MHZ. THIS YEARS SHOWER WAS NOT AS GOOD AS SOME IN THE PAST BUT MANY NEW BRIDS AND STATES WERE WORKED,

THE ARRL UHF CONTEST ON AUGUST 2ND AND 3RD WENT OFF WELL THIS YEAR. TWO GRID EXPEDITIONS WENT OUT WITH 1296 MHZ, 432MHZ, AND 220 MHZ. A TOTAL OF EIGHT BRIDS IN EASTERN COLORADO WAS REPRESENTED! WE WERE ABLE TO WORK KFOM IN WICHITA, KANSAS ON 220 MHZ.

SEPTEMBER WAS A BUSY VHF MONTH WITH THE VHF QSO PARTY ON SEPT. 13TH AND 14TH. ALL BANDS 50 MHZ AND ABOVE COUNTED IN THIS CONTEST.

I HEARD SOME NEW VOICES ON UHF IN AUGUST, (NL7CO AND WØPAN), SO ACTIVITY IS INCREASING LOCALLY! AL (NØCMW) AND I WENT UP TO PIKES PEAK AUGUST 15TH WITH A 10 WATT 1.2 GHZ STATION AND WORKED KXOD ON MT. CAPULIN, NM. (DH86) WITH 8-9 S9B SIGNALS. IT WASN'T LONG AGO WHEN 1.2 GHZ WAS THOUGHT TO BE USELESS OVER 20 OR 30 MILES.

THE "MICROWAVE UPDATE CONFERENCE" WAS HELD IN ESTES PARK ON AUGUST 28-31. ON SEPT 26TH AND 27TH, THE 1ST ARRL 10GHZ CONTEST WAS HELD. DXCC ON 10 GHZ IS JUST 10 BRIDS AND ITS POSSIBLE TO WORK 10 BRIDS FROM PIKES PEAK! (I THINK?!) ANYWAY ODDS ARE SOMEONE FROM COLORADO SPRINGS TRIED TO DO THAT!

73'S AND C U ON THE BANDS. RON NKØP

(Editor's note: This September article got lost in my disk files, and I missed it last month. However, knowing the popularity of Ron's column, I thought you would like to see it this month, along with his October article.)

VHF & ABOVE NEWS
by Ron Deutsch

September saw another record AURORA. A K index of 8 was recorded on September 17th with many reported QSOs across the northern states. I was in Vancouver, BC



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and although I could not make any contacts the visual observation was spectacular! I heard that a faint purple glow was even visible here in Colorado Springs.

The Microwave Update in Estes Park was well attended and provided much gud info for the "ultra short wave enthusiast". I have a copy of the proceedings if any one would like to copy it.

The ORIONIDS meteor shower should peak on October 20th at 1641 GMT + OR - 12 HRS. for about 2 Days.

EME Perigee will be on October 7th with new moon on October 3rd.

The second leg of the 10 GHZ contest will be held on the weekend of October 10th. Full details and rules are in June 1986 QST pg 84.

Check Page 65 of October QST to some of our local hams breaking new ground on 1296 MHZ on top of pikes peak.

WA7KYM near Cheyenne, Wy. reported a Tropo opening early in the morning last week. He worked stations in Iowa and eastern Nebraska for about one hour. If your up at local sunrise give a CQ on 144.200 you may be surprised!!

Thats it for this month. 73s C U on the bands...Ron NKØP

UNEARTHING THE GROUNDING MYTH

by Ray Uberacken, AA6L

We have all replied to questions asked us in the past about RF on the mike, TVI, telephone interference, transmitter audio in tape recorders, etc. with "Do you have your equipment grounded?". Next you'll hear us give advice such as "Make sure you use at least number eight gauge wire, bonded all together in the shack and then a copper strap to a ground rod at least eight feet in the ground". Advice on grounding is probably second only to advice on how to tune your SWRs. The question is "Has anyone ever followed up to find out if all this free advice helps". I wonder what the excuses would sound like if we did. Hams hear this: "Any ground lead more than a few inches long is useless for RF purposes". Why heck, that's all the long my antennas are. Don't get me wrong, a ground is still necessary, but for safety reasons, not RF.

Before giving advice to someone about grounding, think. Ask yourself "What are you grounding?". "How will the ground eliminate just that signal?". What ground impedance will I need to achieve?". Usually the first question that should be asked but never is, is "What's causing the problem?". I guess, in over thirty years in amateur radio, much of it spent as a member of TVI committees, I have yet to see the first time grounding solved an interference problem. Sometimes it changes the conditions enough to eliminate the complaint, but did we just solve the problem temporarily? Did you know that four inches of wire has a reactance of over 100 ohms at one hundred megahertz? Considering that tenths of an ohm is enough to cause problems in many applications, I wonder how many ohms we have in our grounding schemes. Have you ever bonded things together only to find that the problem got worse? Doesn't your equipment already have a ground lead via the third wire in the plug? It should! Will another ground wire cause a loop to exist that increases the problem?

Usually, the reason hams have RF on their mikes, audio rectification in tape recorders, and telephone interference, is not caused by their transmitters. The

usual reason is the antenna. No, not the SWRs either. It is because you are in close proximity to the antenna or, the feedline is oriented so that the field from the antenna induces energy on the outside of the coax. I feel for those of you trying to operate your shacks in an apartment with the antenna in the attic a few feet above your heads. I know, I've been there. I was once known as "the voice of the closet". The only help I have for you is try VHF. Close proximity is defined as within a wavelength or so. Actually, that's only a rule of thumb. It depends on the conditions of the installation and, of course, the power. This is one area power is bad.

TVI is another problem. Since the problems are so varied, it is impossible to give many rules-of-thumb. Three that do come to mind are: high power doesn't help, nearness doesn't help, and grounding doesn't help. The one time I can think of that grounding might help is when the proper design of the antenna such as longwire, should have included an earth ground. In that case, the tuner should have a lead that completes the antenna circuit to earth.

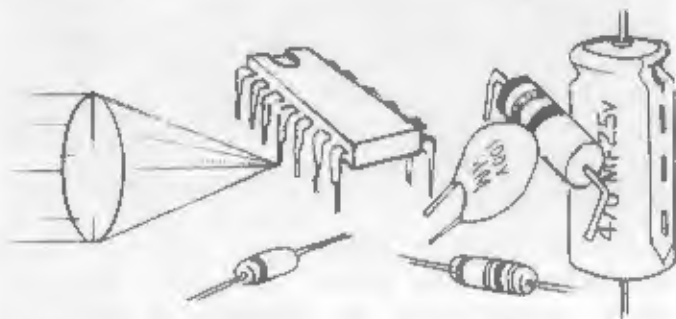
What does grounding do? How does it solve my problem? These questions get complicated when we realize that a piece of wire has both resistance and inductance. Unfortunately, it is the inductance that hurts and there is no effective way to get rid of it. Any piece of conductor that has a length somewhat greater than its diameter has inductance and that inductance will normally be much greater than the resistive part. Inside equipment, you would not think of running a twenty foot piece of wire to ground something so why outside the equipment.

Remember, a ground wire doesn't somehow magically eliminate harmonics from a transmitter or improve your poor operating techniques. It will save your life if a fault occurs in your equipment. Use grounding for the right reason and may lightning not light up your life.

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ANTENNAS

By Chris Smith
WB0DHU

In my last column I mentioned that the key to broadband antennas was in the concept of self-similarity. A self-similar structure is one that can be scaled by an arbitrary factor and still look the same. For example, if you have the plans for a something, and you build it thinking that the dimensions are in feet, and your neighbor also builds it, thinking the dimensions are in inches, and you can't tell the difference when you're done, then it is self-similar.

Perhaps the simplest example of a broadband antenna based on self-similarity is a dipole antenna made from two cones, aligned on a common axis, just touching tip-to-tip. I can't draw it for the column, but to give you an idea of what I am describing, it might look like this:



where the dashes are the common axis and the "X" is a cross section of the cones.

To be truly self-similar it would have to be infinitely large, but in practice, it can be made big enough to work satisfactorily at the lowest frequency of interest, and in general it will work as well or better at the higher frequencies. In the simplest case, the cones would be made of a sheet of conductor, but in practice a wire cage will work. In fact, even a flat outline of a cone, a triangle, will work to some extent—hence the "bowtie" antenna.

The detailed design of such an antenna involves much more than I've discussed. The effect of the ground must be considered, the theoretical impedance of the structure calculated, the method of feed devised, and so on. If interest warrants, future columns might include all of the steps of design, culminating in a "PPRAA" broadband dipole design. Bill Orr, watch out!

Paul, KA0VBD, had two questions concerning antennas: How do you decide how long to cut them, and will the coax have any effect? There are simple (but unsatisfying) answers. The easiest way to find the length of an antenna is to use a formula appropriate for that design and then cut the wire about 5% long. Put the antenna up (maybe not all the way but get it off the ground) and trim it shorter an inch or two at a time (for an HF band antenna) while measuring the SWR. You progress from longer to shorter because it is easier to shorten an antenna than make it longer.

The coax shouldn't have an effect on the antenna, but in most cases, it will. A coax will have an influence on an antenna whenever current is allowed to flow on the outside of it. To avoid this, the coax must either be isolated from the antenna, or symmetrically coupled to a symmetrical antenna. The first case might be a coax running inside a car to a feed-through in the roof for a vertical, the second would be a coax running perpendicular to a dipole fed through a balun. In many less-than-ideal cases, good design practices keep the current on the outside of the coax to a small enough value that it can be ignored.

Next month: Can this antenna be saved?
— A look at Don Hohlisel's inverted vee.

NOVICE CLASS

The long-awaited PPRAA Novice Class will start on 15 October and run through 26 November. The classes will meet every Wednesday and Friday at 1900-2130 in the Civil Defense classroom under the Main Police Station at Kiowa and Nevada.

Contacts: Don Ross, NL7CO at 390-4419.

FREE - FREE - FREE

EDUCATION

Having had my arm twisted, my life threatened, and my HT held for ransom, I decided to work on the Education Committee. The Novice Class starts 15 Oct and we are looking at a Tech/General Class in January 1987. If you would like to help, or have suggestions, contact me please.

Vy 73's - Don, NL7CO

ARES COMES THROUGH AGAIN

BOB, K4UBU

On 27 Sept 86, 14 local ARES members provided communications for a local disaster exercise. Comments from the CSFD indicate that the only reliable comms came from ARES.

Participants were:

K4UBU, N0CYR, NL7CO - Site Communications

KE98, W0YNE, N0FPP - Packet Links

WA0MNL, WA3SKK, N0EPF, N0CYS
- Hospital Communications

KD5ZW, WB7THT, WB9UXR, WD6AMZ, KA2GHN
- Ambulance Communications

W0MMH - Base Communications,

Jeff Boyes - Runner.

Thanks to all the participants for an first-class public service project and for the excellent high-profile publicity for amateur radio.



Al N0CMH was the chief operator for the Grid Dx-pedition on August 2 with Jim, WA9ABB and Charles, ex-WD9DWJ to grids DM 77, DM 87 and DM 88.

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Charles, ex-WD9DWJ uses the Armstrong Rotor on one of the several multi-multi element VHF and UHF beams during the Grid Dx-pedition with Jim, WA9ABB and Al NØCMW.

MINUTES OF SEPTEMBER GENERAL MEETING
submitted by Al NØCMW, secretary

The general meeting of the Pikes Peak Radio Amateur Association was held at Giuseppe's Old Depot Restaurant, Wednesday evening 10 September 1986. Meeting was called to order by the president Les KCØNC at 19:45. We had 31 members and 14 guests present. The minutes of the last meeting were approved as printed in *Ø-Beat*.

Committee Reports

Treasurer - Bud NØDDF: Previous balance of \$2521.40, income of \$225.75 with expenses of \$552.59, leaving a balance of \$2194.56.

Teller County Hill Climb - Doc WØMCT: Volunteers asked to contact Doc, or Jerry KEØBR who will be Net Control. Dates are 20-21 Sep.

Colorado Council of Amateur Radio Clubs (CCARC) - Bud NØDDF: Colorado will use 15 khz separation on repeaters.

Deaf and Blind School - Jim WA9ABB: Novice classes will start soon after school starts.

Ø-Beat - Phil VE1ARC: Vote tonight on best articles in July, August and Sept.

Donation to Deaf and Blind School: Oak, KØROL donated the \$33.00 proceeds of his "giveaway" at the Woodland Park Swapfest to the Jim for the D&B School.

ARES - Jake NØCYR: A civil defense disaster exercise to be held on 27 Sep. Need 20 hams for ambulances, base stations at Memorial, St. Francis and Penrose hospitals.

Ringo Ranger antennas in place at Memorial, Penrose Community, Fort Carson, and Air Force Academy with Penrose Main pending.

Old Business:

ARRL has not yet responded to club on awards proposal.

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Malcolm KE9S volunteered and was accepted to head the Pikes Peak Hill Climb next year.

Announcements:

Rick WB7THT announced that the Christmas Party will be at Iron Springs Chateau dinner theatre. Cost is \$14. per person. Contact him for more info.

A thank you was extended to Oak KØROL for the excellent hospitality at his cabin for the nice club picnic.

Much discussion occurred concerning the Novice Classes, specifically whether they should be strictly novice or combined novice/tech/general. A series of motions resulted in letting the Education Committee run the classes as they saw fit. Don NL7CO volunteered to head up this committee.

Beer was that the Endura has been cancelled.

Charles KCØTI announced a road rally in West Cliff.

Prizes - Don KEØBJ: Winners were:

KIDSW	Walt	Complete DX Book
WA9XE	Jim	Plug-in outlet center
KADPE	Gennie	\$10. Centennial cert.
NØHCT	Doc	1001 fasteners kit
KAVBO	Paul	\$10 Walker cert.

Program - Lauren KXØOI: Lauren provided a very amusing and informative talk on hi-power amplifiers, complete with a helpful handout. Nice job Lauren!

Prizes for O-Beat Articles:

1st	Club jacket	George	NØCIX
2nd	Club hat	Ron	NKØP
3rd	Club nametag	Chris	WBØDHU

Winner of the 2 meter HT:

Congratulations to Doug NØHJT

MINUTES OF SEPTEMBER BOARD MEETING submitted by Al NØCMW

The board meeting was held on Monday, 15 September 1986 at the home of Don, KEØGJ. Those in attendance were Les KCØNC, Al NØCMW, Jim WA9ABB, Bud NØDDF, Phil VE1ARC, Malcolm KE9S, Ken WA6TTY, Oak KØROL and Don NL7CO.

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TAB BOOKS

A motion was passed to give Malcolm KE9S \$150.00 for expenses on next years Pikes Peak Hill Climb. A motion passed not to have prizes for articles in O-Beat. A motion was passed to give two sets of the ARRL Library collection to the Colorado Springs Public Library. A motion was passed to purchase 20 "Tune in the World" books to sell to Novice Class attendees. Don NL7CO was authorized to buy the "Tune in the World" slide kit, not to exceed \$100.00. (note: cost was \$25.00). A motion was passed to authorized \$25.00 for flyers, etc. to get the word out on the novice classes.

A new place for the Sat. morning breakfast was suggested: the Bavarian Inn. Majority were happy with current location. No action taken. Jim WA9ABB volunteered to head next years swapfest and was accepted. The swapfest will be held the 3rd weekend in May.

Home brew night will be in January. Prizes will be \$20.00, \$10.00 and \$5.00.

The board nominated the following for club election at October meeting, with nominations also being accepted from the floor: Pres. Don KEØBJ, Vice Pres. Don NL7CO, secretary Al NØCMW, treasurer NØDDF, board members Oak KØROL and Ron NKØP.

The next meeting of the board will be at the home of Jim WA9ABB on 13 October 1986. The meeting was adjourned at 21:00.



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PS 430 Power Supply \$157 - PS 30 \$150
Kenwood PS 50 power supply \$199
Kenwood AT 250 auto antenna tuner for 430S \$299
Kenwood AT 130 tuner \$149 AT 230 Tuner \$199
Icom 735 \$845
Icom 745 \$885
New Yaesu 767GX goes everywhere, does everything \$1575
Yaesu FT 757GX \$270 - 2 only
Kenwood 4000A 2m & 440 FM Xcvr Sale \$519
Kenwood TR 3600 440 MHz HT \$329 - \$15 Factory Rebate
Kenwood TR 2600A new HT w/extra battery \$315 - \$15 Factory Rebate
New Kenwood TR 751A 2 meter all mode w/GaSfet preamp \$519
Kenwood TH21AT \$215 TH41AT \$229 - both with free extra battery and \$10 Factory Rebate
Kenwood TM 2570A 70 watt 2 meter FM mobile \$479-\$40 Factory Rebate
Kenwood TM 2550A 45 watt 2 meter FM mobile \$379
Kenwood TM 2530A 25 watt 2 meter FM mobile \$349
Santec 20T w/2 number memory dialer \$275 w/additional \$10 factory rebate
Complete line of Tokyo High Power amps, preamps & tuners at lowest prices.
New Azden PCS 5000 \$285
New Icom 48A 440MHz \$440
New Icom 28A-132-174 MHz scan/receive 25W \$379
New Icom 28H same specs as Icom 28A w/45W \$399
Icom 2AT HT \$258
Icom 02AT \$358
Icom 4AT \$295
Icom 04AT \$379
Icom 27A w/TIM \$379/Icom 27H w/TIM \$395
Icom 47A \$471
Icom 3200 2 meter/440 dual bander \$499
Daiwa Meters, Switches & Rotors - In Stock
Mirage Amps - Low Prices - In Stock
New KDK FM 240 mini 25W w/TIM & LCD display, encoder/decoder TO 156 MHz receive \$120 w/o tone \$290
New Yaesu FT 209RH 5 watt FM HT \$299
Yaesu FT 2700RH 2 m-70 cm dual bander full duplex-free encoder \$519
Now a factory dealer for Ten Tec — In stock specials:
Corsair II HF xcvr \$995
Century 22 HF CW xcvr \$449
Special of the Month
New Ten Tec IT920 Air Band HT 108-136 MHz AM \$375
New generation Ten Tec 2591 2 m HT \$269, 1 demo unit \$250
Astron PS — ALL AMPS — Low Prices — Astron RS 90 and V50 In Stock
Now a factory dealer for Mosley antennas—Special prices until 11/30—full line in stock,
Butternut HF6V 80-10 mtr vertical \$115 Butternut beam \$175
KLM 160V 160/80/40 vertical \$96 - 1 only
BBW AXS 160 shortened 160/30 mtr. dipole 95' long \$94
BBW AXS 80 shortened 80/40/15 mtr. dipole 84' long \$94
BBW AS 80 shortened 80/40/20 mtr. dipole 78' long \$94
Welz test meters in stock — all power levels and frequencies
New B & W V5 300 tuner-bmt 300W tuner for the price! Special \$84
Amp Supply LA 1000A 1000W PEP amp—Special \$415
Amp Supply AT 1200 Tuner Special \$190
Now a distributor for Ameritron Amplifiers — AL 80A - 1 3-500Z — In Stock \$649
AEA CPT/64 MBA Text Pac \$210
AEA PK 232 data controller internal HF/VHF modem \$305
AEA CP-3 Computer Interface \$178
AEA PK 64 packet/cw/rty etc. controller \$210 — HF/M \$95
AEA PK 64 system w/HFM 64 installed \$310

Factory Dealer for Kantronics — In Stock!

Kantronics KPC 1 Level 2 - special sale \$139 - 1 only
New Kantronics Packet Program—includes program for UTL
Kantronics Packet Controller version 2 w/HFM \$190
Kantronics Interface for VIC 20 and others \$125
Kantronics Universal Terminal Unit \$165
Kantronics Hamtext Hamsoft \$89
Coming in November—Kantronics KAM all mode controller—
CW/RTTY/ASCI/AMTOR or Packet \$279
MFI wet & dry dummy loads — In stock
MFI Tuners and Keyers — In stock
MFI 989 roller inductor tuner \$288
MFI 962 1.5 kW tuner—160 to 10 meters \$299
New MFI 1224 interface in stock w/free soft program Summer Sale \$75
MFI 1229 interface w/free soft program Summer Sale \$155
In Stock! MFI 1270 packet controller (TNC-2) clone \$119

USED EQUIPMENT

Kenwood TR 2600 w/2 batteries \$250
Kenwood TR 3600 — like new \$250
Kenwood TY 4000A — like new w/FLIAC encoder \$450
Kenwood TR 9130 2 meter all mode mobile — Nice — \$425
Kenwood TS 530S \$450
Kenwood TS 520 \$330
Kenwood TS 520S \$350
Kenwood 517 desk power supply/charger for TR 2400 \$35
Kenwood AT 250 auto tuner \$280
Icom 740 \$475
Icom PS 20 p.s. \$120
IC 740 & PS 20 combo for \$365
Azden PCS 4000 25W mobile FM \$225
Tempo 515 w/new extra battery \$175 Tempo 51 \$95 SS \$110
KDK 2030 25W 2 meter FM \$175
Ten Tec 5800D - all filters \$495
Ten Tec Century 21 CW xcvr \$195
Yaesu 757AT auto tuner \$195
Yaesu FT 101E \$350
Yaesu FT 101B \$100
Yaesu FT 101B ext. VFO \$75
Yaesu FT2100B used mini \$325
Yaesu FP757 power supply \$90
AEA CPT/64 w/MBA TextPac \$125
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